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Our creation

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We deliver trusted
Solar-powered pumps

ZGTPYBY® **CTT®**

FEILI PUMP CO.,LTD

USING MANUAL OF SOLAR PUMP

CONTENTS

Solar Panel Selection

1.Solar Panel Connection Principle

Solar panel can be divided into mono-crystalline silicon solar cell, polycrystalline silicon solar cell and thin-film photocell. Mono type is the most efficient one but the price is the highest; the thin-film photocell is the cheapest one. Normally, the power of solar cell is 150W per square meter. The open-circuit voltage (Voc) marked on solar cell means the max electromotive force before working. The voltage will decrease when working, its voltage called working voltage (Vmp). Common open-circuit voltage is 21V, 36V, 44V etc. it changes along with the change of area and temperature, the lower the temperature, the higher the voltage. Another important index is power. It is proportional to the panel area. There need some solar cell to connect in series if the voltage is not enough, total voltage equals to adding each panel's voltage.

The working voltage of solar cell need to select according to the controller's working voltage, and then to confirm the open-circuit voltage of solar panel. Then select the solar power according to the pump power after the voltage confirmed. The power of solar water pump is input power and the generating efficiency of solar panel is under 70% usually. In order to ensure the rated working time of 4 hours a day, the solar panel power equals to input power multiply 1.5 which is also the minimum power. If the solar panel power is smaller than this value, the pump can not reach its rated flow and head even through it can still work normally. Using more panels for the pump is better if condition permits, because that is able to ensure more time for the pump to running and reach the rated flow and head.

WARNING!

The controller will be burned out when the open circuit voltage higherthan our setting.

ตัวควบคุมจะถูกเผาเมื่อแรงดันไฟฟ้าวงจรเปิดสูงกว่าการตั้งค่าของเรา

Le contrôleur sera grillé lorsque la tension de circuit ouvert plus haut que notre réglage.

El controlador se quemará cuando el voltaje de circuito abierto más alto que nuestro entorno.

سيتم حرق وحدة التحكم عند فتح جهد الدائرة أعلى من وضعنا.

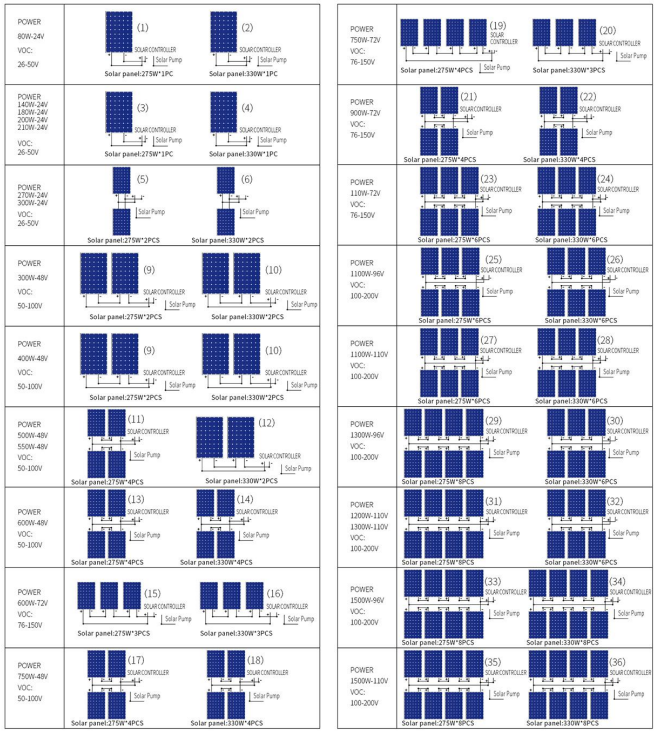
Controller and pump matching method					
Controller model	Adaptable pump	Max.input current(A)	Max.open voltage(V)	MPPT voltage range(V)	Working temperature
FL–24	Rated 24V pump	15	<50	30–48	–15–60
FL–48	Rated 48V pump	15	<100	60–90	–15–60
FL–72	Rated 72V pump	15	<150	90–120	–15–60
FL–96	Rated 96V pump	15	<200	110–150	–15–60
FL–110	Rated 110V pump	15	<200	110–150	–15–60

Solar panel description:

275W
Max power:275W
Short circuit current:9.32A
Open circuit voltage:38.5V
Max power current :8.66A
Max power voltage:31.79V

330w
Max power:330w
Short circuit current:9.57A
Open circuit voltage:44.72V
Max power current :8.66A
Max power voltage:37.26V

Solar panel recommendation for 24-110V DC solar pump



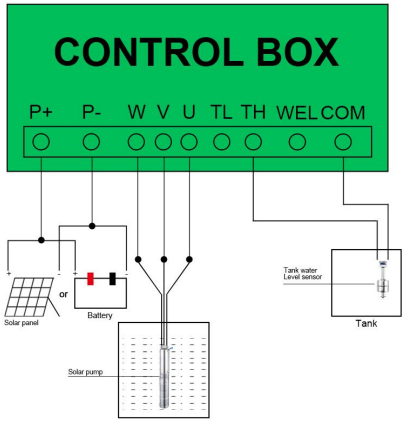
Tips:

When it's series connection, the voltage is added, but the current is not changed; When it's parallel connection, the voltage is unchanged, but the current is added.Before the power is on, you must use the instrument to detect the open circuit voltage of solar panels, or apply for series, parallel knowledge to calculate the solar panel open circuit voltage. The open-circuit voltage of solar array must be less than the maximum input voltage of the controller, otherwise will cause irreversible damage.

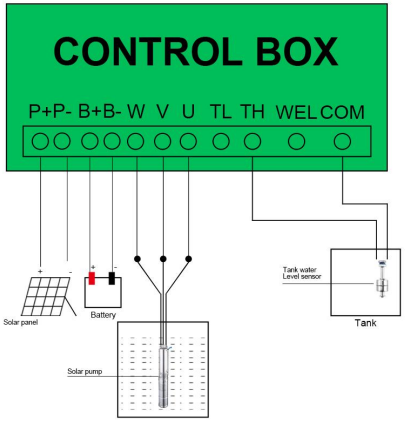
Wire the pump, panels to the control box as per the wiring diagram below. Please connect the pump to the controller making sure they do not touch each other. Later when we test the system if the wiring is incorrect the pump will run backwards and you will only have to swap over two wires to get it running correctly.

When connection with battery, make sure the polarity is correct, plus to plus, minus to minus.Charge controllers generally have the following connections:Battery,Panel and Load either written or in pictorial form. The pump controller solar PV input is connected to the load terminals of the pump controller. As a safety margin we recommend the charge controller be able to supply at least 1.5 times the pump requirements. Selection way is mentioned above.

Caution: If wiring a battery be very careful not to reverse or short the terminals. We advise you remove all metal wrist bands or watches before you start. Solar PV panels when connected together can also produce a lot of energy so caution must also be exercised here as well.A dark cloth to shade the panels is a good precaution to reduce the power output.



DC:24V-110V



CHARGE CONTROLLER
DC:24V-48V

Wiring diagram

Tips1: do not reverse the positive and negative of power, otherwise it will not work.
Tips2:before you start wiring the controller box switch must be in the off position.

Wire the pump,panels to the control box as per the wiring diagram below.Please connect the pump to the controller making sure they do not touch each other.Later when we test the system if the wiring is incorrect the pump will run backwards and you will only have to swap over two wires to get it running correctly.

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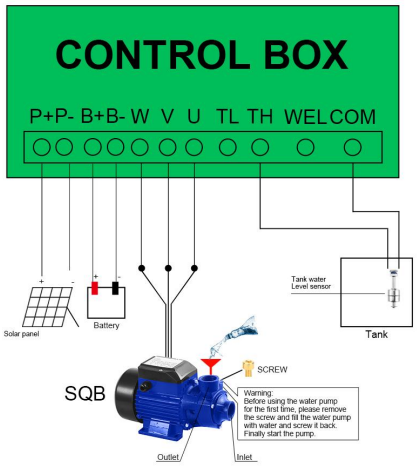
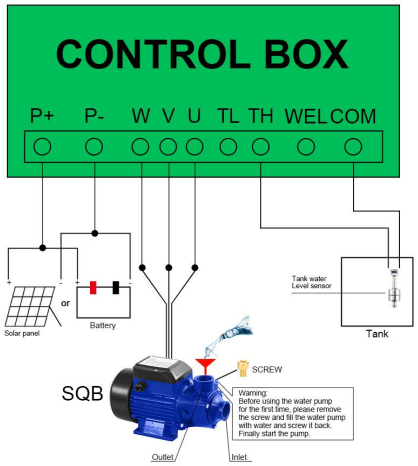


CHARGE CONTROLLER
DC:24V-48V



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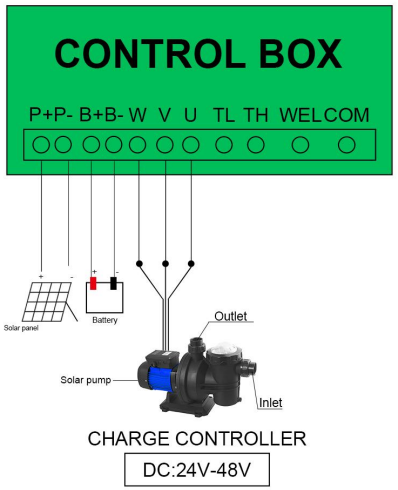
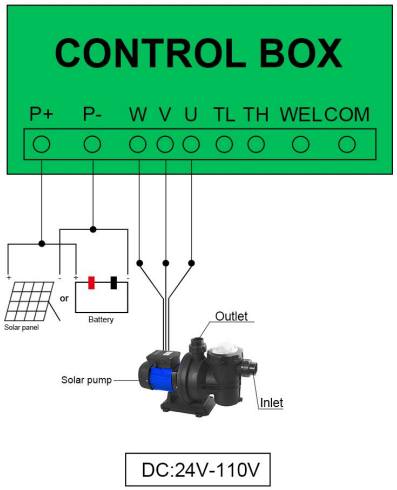
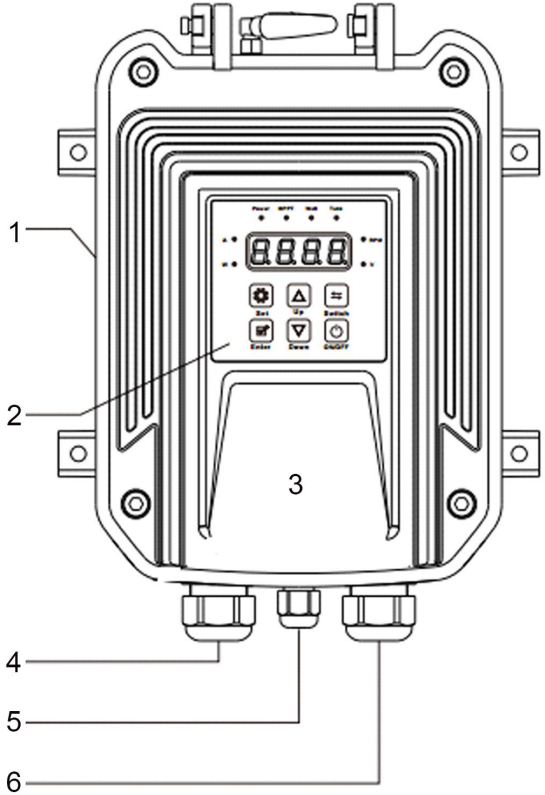


CHARGE CONTROLLER

DC:24V-48V



DC:24V-110V



1.Nameplate and caution.
2.Operation panel
3.Company logo.
4.DC electric cable entrance.
5.Water level sensor cable entrance.
6.Pump electric cable entrance.

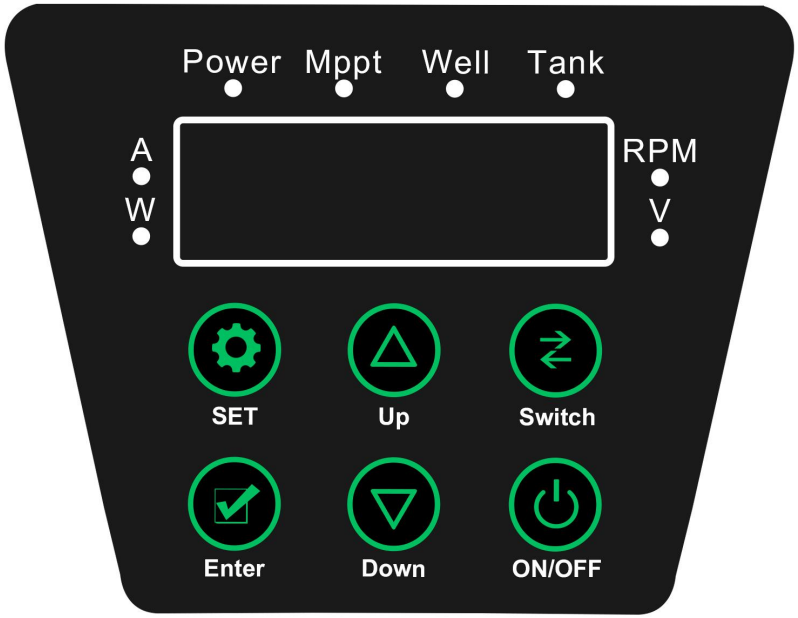
Parameters of MPPT Controller

PCB and Pump Matching Method						
PCB Model	Adaptable Pump	Rate Input Power (KW)	Maximum Input Current (A)	Maximum Input Voltage (V)	MPPT Voltage Range (V)	Working Temperature (℃)
FL24-FR36	Rated 24V Pump	0.36	15	48	18-36	-15-60
FL48-FR75	Rated 48V Pump	0.75	15	96	24-72	-15-60
FL72-F1R1	Rated 72V Pump	1.1	15	150	50-112	-15-60
FL96-F1R3	Rated 96V Pump	1.3	15	180	60-135	-15-60

WARNING!

The controller must match with the recommended solar pumps.Please do not use the controller for other pumps. If cause any problems because of this reason, We do not bare any responsibility.For the perfect performance and long-life working, the controller should be kept away from strike, shake, sunshine, salt mist, oil mist and etc. Because of the power loss from cable, please try to use the shortest cable. While use longer cable, the cable connecting controller and solar panels should be over 4mm^2 (Do not use single wire kind).While the cable between controller and pump within 30m,the cable should be at least 2mm^2. While over 30m, the cable should be at least 4mm^2

Operation Panel



1.LED Indicator Light

- Voltage(V): Voltage indicator lights.
- Speed(RPM): Speed indicator light.
- Current(A):Current indicator light.
- Power(W): Power indicator light.
- Tank: Light when tank is filled with water.
- Well: Light indicates no water in well.
- MPPT: Solar energy running lights (twinkling).
- Power: light twinkles when stop working, light is constant in running.

2.Key Operation

Key Type	Function
 Set Key	➤FunctiaParameter settingon
 Enter	➤Parameter confirm
 Up	➤RPM setting key, Each time you press, the RPM will increase for one grade. ➤In fault state, turn off / on the fault display.
 Down	➤RPM setting key, Each time you press, the RPM will decrease for one grade.
 Switch	➤In the operation status, you can circularly switch the display mode in voltage (V) - > speed (RPM) - > current (A) - > power (W).
 On/Off	➤In the running state, you can turn it off. ➤In the stop state, you can turn it on.

Test Running

1.Before using, you should check whether the solar water pump is in good condition, such as joint loose, oil impregnate or oil leak and cable damaged, and you should apply megger to check the insulation resistance, which should be larger than 2MΩ when the engine in cold state.

2.If the cable length needs to be lengthened, the diameter of extension cable should be larger than the original cable. And the joint need to seal with mackintosh.

3.Pump's working direction should be anti-clockwise direction, check whether pump's rotation direction is right, here remind that can only test pump in short time, because submersible pump is forbidden to dry run.

4.When installation, the pump should be hung on the rope and it is strictly prohibited to lift the pump through its cable. The submerged depth should one meter more than bottom in case of the sediment suction of sand damage the mechanical seal and impeller.

Operation Mode

1. Pump Start

1) Power on to start

Every time it connect with electricity, the system default boot, and pump start immediately without testing water tank (without any Shutdown conditions).

2) Button to start

In shutdown state, press the button  to turn on the pump, without testing water tank (without any Shutdown conditions) .

3) Water Shortage to Start

If the system boot but the pump is off, when the tank water level is lower than TL float switch, the pump start work automatically.

2.Pump Stop

1) Float Switch Mode

In running state, when the water full switch is closed, the pump immediately stops. (Float switch's two cables connect TH and COM terminal, and the Tank light is on)

In running state, when the water shortage switch is closed, the pump immediately stops. (Float switch's two cables connect WEL and COM, and the Tank light is on)

2) Dry Pumping Shut DownIf the water pump continuous work for a period of time, and the power is less than the set power at the current speed and continues for 20s, the pump will stop immediately and report P48 fault. After 30 minutes, the fault is cleared.

3) Button to Stop

In running state, press the button 

to turn off the pump.

3.Pump Operation

Every time the pump starts, it will recognize the DC (battery) and PV (solar) power supply mode for 10 seconds, and then switch to the corresponding mode to run. The setting speed is invalid during the identification process.

1) DC Mode (battery)

In DC (battery) mode, the pump speed is adjustable, range of 1000-4000 RPM.

The default setting speed is 4000RPM. The speed can be set by the 

or 

keys, and the speed can be increased (or decreased) by pressing the increment (or decrement) button.

When pump keep running for a long time, DC (battery) power's voltage will be lower accordingly. In order to prevent battery over discharge, when input voltage is lower than controller set corresponding Protection Voltage, pump will stop working automatically.

Model	Protection Voltage(V)
FL24-FR48	20
FL48-FR75	40
FL72-F1R1	60
FL96-F1R3	80

2) PV Mode

For PV model, pump speed setting is similar as DC mode, maximum speed is also 4000rpm. And Solar power will also influence pump's speed. MPPT controller will track solar panels' power, when sunshine is stronger, the input solar power is increasing, pump speed will be higher, and vice versa.

In PV mode, the MPPT indicator flashes. If it flashes faster, it indicates that the current working point is closer to the maximum working point. If the flashing frequency is slower or not, it indicates that the maximum power point is being tracked.

If solar power is insufficient, the pump speed will continue to fall, when the speed drop to 600 RPM, pump stops, and report P46 faults after 3 second.

When solar power is too insufficient to maintain the current system of starting or running, the output voltage of solar panels will drop rapidly.

When the minimum voltage drops to the lowest voltage of system and lasts for 10s, it will report "PL" fault. Try consecutively 5 times to restart, if it still appears "PL" fault, hold this state for 30 min, then try to start again.

4.Reverse connection protect

If the positive and negative of power supply is reversed, the controller will continue to alarm.

5.Dry-run protection

This function refers to the pump pumps out water from well, the system can automatically detect the anhydrous state, pump will stop working automatically by set program. Dry-run protection is effective all working modes, in manual mode, float switch model and solar mode Pump will Standby for 30 minutes to restart the work (meet the start condition). Start to detect again whether there is water or not, if no water, stop working automatically; there is water, keep working, that cycle repeats.

Servicing and Maintenance

1.After working 3000 hours, the easily damaged parts should be replaced (such as bearing, sealing ring, mechanical seal), or it may cause much more serious damage.

2.If the pump didn ’ t use for long time, please scrub it, place at dry and ventilated place and keeping properly.

Selecting the battery for the pumping system

You will need to buy battery if you want to pump water when it is not sunny. Please note if you want to add batteries you will need to double the number of PV panels .The extra PV panels are required to charge the batteries while the pump is pumping.

The cheapest option is to try and fill an elevated header tank or if you have no elevation locate the tank near a utility power supply so you can pump water from the tank using a mains powered pump.

You must use deep cycle batteries not car batteries. Deep cycle batteries are designed to take much lower continual discharges than regular car batteries. Deep cycle batteries normally have an ”amp hour" rating shown as AH, for instance 100 Ah. Use the following formulas for calculating battery size required for backup.

Please note even with a deep cycle battery discharging it to a low level will shorten its life, this is why we use 60% as a discharge level.

Current drawn by the pump = pump power divided by the voltage.

In the case of a 24 volt 300 watt pump.

300 watts divided by 24 = 12.5 amps.

2 x 100AH 12 volt batteries in series = 100 AH at 24 volts.

100 AH divided by 12.5 amps x 0.6= 4.8 hours of backup

Batteries in parallel, add the AH, voltage stays the same.

Batteries in series, add the voltage, AH stays the same.

Connecting a longer cable to the pump. (cable must be at least 2mm² section)

Use the parts contained in the cable connector kit (heat-shrink tube and tape) to connect a longer supply wire to the pump. If you don't have a heat gun to shrink the tube, the barrel of your soldering iron will do or you can use a butane torch but with great care so you don't melt the insulation or set it on fire. Bare the insulation back as shown above.

1/ Layout the components needed to make the join.

2/ Put the large diameter piece of heat-shrink over the main cable and then the smaller diameter pieces over the individual wires.

Keep the heat-shrink back away from the joints as you solder them.

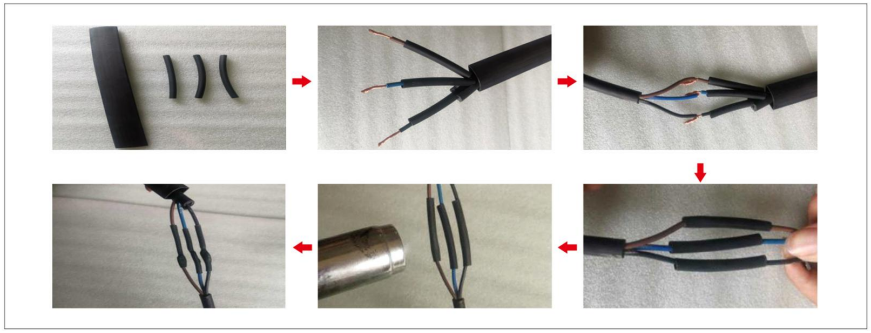
Any heat transfer will prematurely shrink the heat-shrink.

3&4/ Slide the small heat-shrink over the soldered joints and heat using a heat gun or alternative heat source to shrink the sleeve down over the wires.

5/ Wrap the tape over the sealed joints.

6/ Finally slide the large diameter heat-shrink over the completed joint and shrink to it.

Place the pump in water before you start wiring the controller box. This will allow the pump to go through the pre-conditioning required. Do not Put the pump in its final position until you have test it, unless it is easy to see and remove.



Fault Information and Troubleshooting Method

NO	Fault Code	Fault Description	Causes and Solutions of Fault	Recovery Procedure
1	P0	Hardware Overcurrent	★Motor model is mismatch, please choose matching pumps ★UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
2	P43	Phase Protection	UVW three-phase open circuit, please rewiring to ensure it reliable contact.	Automatically remove after 30s
3	P46	Stall Protection	★Motor model is mismatch, please choose matching pumps ★Pump extension cord is too long, please reduce the extension cord ★Power is too low, increase the power supply ★Pump bearing is stuck, please clean pump bearings	Automatically remove after 30s
4	P49	Software Overcurrent	★Water pump bearing stuck, clean pump bearings ★UVW three-phase short-circuit connection, please rewiring to ensure the normal installation of UVW	Automatically remove after 30s
5	P50	Low Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
6	P51	High Voltage Protection	The input voltage is too low, please distribute power refer to the electrical characteristics.	Voltage return to normal, remove the fault immediately
7	P48	Dry-run Protection	★Not all of air in the pump is exhausted, cut off the power, re-power and start the pump drainage after 30 seconds ★There is no water in the water tank waiting for water, it will restart	Automatically clear after 30 minutes or re-power to clear
8	P60	High Temperature Protection	The temperature of controller MCU is more than 90℃	Automatically clear after the temperature is normal
9	E8	Current Sampling Failure	Cut off the power and restart after 30 seconds	Restart the power
10	PL	Power Shortage	★No sunlight, waiting for the sunlight to restart ★Solar panel matching error, refer to the recommendation to match correctly	At the first 5 times, it will removal after 30 seconds, and then 30 minutes to removal
11	ALARM	Reverse connection protect	Exchange the positive and negative wire	Restart the power
12	P42	Start fault	1-7 fault,appear continuously for several times in 10 minute. Check N0.1-7 fault.	Restart power.

Supplement of charger controller

Automatic detection working mode: pure solar mode or solar + lead-acidbattery mode.Note for use: When using the solar + lead -acid battery mode, you need to turn on the lead-acidbattery to supply power to the controller firstly, the "Charge" light is on, and then turn on the solar battery to supply power.

Indicator light:
Power light: always on in power-on state and standby state, off in shutdown state, flashing in
setting state
Sys light: system status, normal status is off, abnormal shutdown status flashes.
MPPT light: flashing indicates that the MPPT is working, only the "solar mode" has an indication, and the "solar + battery" is always on.
Charge light: In the "solar + battery" mode, it flashes to indicate that the battery is being charged, and it goes out in the "solar mode".

Button:
SPEED button: Enter the speed setting state. The speed, the number of poles of the motor, thesensitivity of idling protection, and the temperature control enable can be set.
TIME button: enter the time setting state. You can set the fault restart time, the start delay when the water tank is full, and the start delay when the water is lacking.

VOLTAGE button: Enter the rated voltage setting state. Rated voltage, maximum power, and minimum power can be set
ENTER button: Set confirmation status. It only works in the setting state. Long press to lock
SPEED, TIME, VOLTAGE
Up key: Parameter plus key, only works in setting state.
Down key: Parameter reduction key, it only works in the setting state.
DISPLAY key:
In running state, switch display: speed, voltage, current, power.
In the shutdown state, switch display: "OFF", voltage, fault number.
In standby mode, switch display: voltage, automatic start countdown, fault number
In setting mode, switch the data bits that can be set.

Fault code: fault description
E - - 1：low speed protection。
E - - 2：low power protection。
E - - 3：Locked-rotor protection shutdown。
E - - 4：dry-run protection。
E - - 5： short-circuit of motor。
E - - 6：MOS tube short-circuit shutdown。
E - - 7：hardware over current。
E - 1 0：dangerous voltage。
E - 1 1：Abnormal driving voltage。
E - 1 2：no water in well。
E - 1 3： water full in tank。
E - N C：Normal, waiting for self-start (self-recovered after failure).